PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:		)	
		)	
Douglas E. Weiss		)	Examiner: Tsoy
		)	
Serial No.:	09/853,217	)	Group Art Unit: 1762
		)	
Filed:	May 11, 2001	)	Docket: 55944US002
		)	(102.0035US01)
For:	Pulsed Electron Beam Polymerization	)	

APPELLANTS' BRIEF ON APPEAL

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I. REAL PARTY IN INTEREST

The Real Parties in Interest are 3M Company, formerly Minnesota Mining and Manufacturing Company, and 3M Innovative Properties Company, both Delaware corporations.

II. RELATED APPEALS AND INTERFERENCES

Applicant is aware of no prior or pending appeals, judicial proceedings or interferences which may be related to, directly affect or be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF THE CLAIMS

Claims 1-15 and 18-22 are pending in the application. Claims 18-22 have been withdrawn. Claims 1-15 have been rejected. Rejection of claims 1-15 is appealed. A complete listing of the pending claims is provided in the Claims Appendix at the end of this brief.

IV. STATUS OF AMENDMENTS

The last office action was mailed on October 20, 2006. In response, Applicant filed a notice of appeal. Applicant does not believe that any outstanding amendments have not been entered.

V. SUMMARY OF THE INVENTION

The present inventive takes advantage of the special kinetic properties that result from pulsing an electron beam to polymerize a composition. As a result, the method enables continuous production of articles using the process, such as pressure-sensitive adhesive articles. The method enables the polymerizable composition to be polymerized in a single phase and on-web. An article is made while it is being polymerized, which is a very efficient, one-step process.

Claim 1 is directed to a polymerization method comprising providing a substrate and coating at least a portion of the substrate with a polymerizable composition. A pulsed electron beam that is capable of producing pulses of accelerated electrons is used to irradiate the polymerizable composition. The pulses of accelerated electrons heterogeneously polymerize the polymerizable composition in a single phase. The pulses of accelerated electrons have a dose per pulse of about 10 to about 90 Gy, and the composition is irradiated with said pulses of accelerated electrons at a pulse rate equal to or greater than about 500 pulses per second.

Support for claim 1 is found, for example, at page 10, line 11 to 16. Discussion of the dose level is found, for example, at page 41, lines 1 to 21, including Tables 4 and 5 and Figure 5. Additional disclosure of dosage is found, for example, at page 26, line 12 to page 27, line 21. The pulse rate is described, for example, at page 13, line 13 to 30.

Claim 2 is directed to the method of claim 1, wherein the polymerizable composition comprises at least one polymerizable monomer, at least one oligomer, or a blend thereof. Claim 3 is directed to the method of claim 2, wherein the polymerizable monomer comprises a C_{8-13} alkyl acrylate monomer. Claim 4 is directed to the method of claim 3, wherein the C_{8-13} alkyl acrylate is selected from the group consisting of isooctyl acrylate, 2-ethylhexyl acrylate, lauryl acrylate and tridecyl acrylate.

Claim 5 is directed to the method of claim 2, wherein the polymerizable monomer is selected from the group consisting of methyl methacrylate, isobornyl acrylate, tripropyleneglycol

diacrylate, pentaerythritol triacrylate, pentaeryritol tetraacrylate, hydantoin hexacrylate, and trimethylolpropylenetriacrylate. Claim 6 is directed to the method of claim 2, wherein said polymerizable composition further comprises at least one comonomer. Claim 7 is directed to the method claim 6, wherein the comonomer is selected from the group consisting of acrylic acid, isobornyl acrylate, octylacrylamide and n-vinyl pyrrolidone.

Claim 8 is directed to the method of claim 2, wherein the polymerizable composition further comprises a crosslinking agent. Claim 9 is directed to the method of claim 2, wherein the polymerizable composition further comprises a thickener.

Claim 10 is directed to the method of claim 1, wherein the polymerizable composition is irradiated with pulses of accelerated electrons during a residence time of about 1.5 seconds to about 5 seconds.

Claim 11 is directed to the method of claim 1, wherein the polymerizable composition is irradiated with pulses of accelerated electrons having a dose per pulse of about 10 to about 40 Gy.

Claim 12 is directed to the method of claim 1, wherein the polymerizable composition is irradiated with pulses of accelerated electrons at a pulse rate of about 500 to about 3,000 pulses per second. Claim 13 is directed to the method of claim 12, wherein the polymerizable composition is irradiated with pulses of accelerated electrons having a dose per pulse of about 10 to about 30 Gy.

Claim 14 is directed to the method of claim 1, wherein the polymerizable composition is irradiated with pulses of accelerated electrons at a temperature below 20 °C.

Claim 15 is directed to the method of claim 1, wherein the polymerizable composition is irradiated with pulses of accelerated electrons at a temperature below 20 °C for about the first 40% to 70% of the time period that said polymerizable composition is irradiated.

VI. ISSUES PRESENTED FOR REVIEW

Whether claims 1-15 are obvious under 35 U.S.C. 103(a) over Weiss et al (WO 00/04055) in view of Loda (U.S. 4,163,172), Mukohyama et al (U.S. 4,886,840) and Botman et al (Nuclear Instruments and Methods in Physics Research B 139).

VII. ARGUMENT

In *KSR Int'l Co. v. Teleflex, Inc.* the Supreme Court reiterated the essential Graham v. John Deere Co. obvious analysis that set out a framework for applying the statutory language of §103, language itself based on the logic of the earlier decision in Hotchkiss v. Greenwood. *See* KSR Int'l Co. v. Teleflex, Inc., No. 04-1350 (U.S. Apr. 30, 2007), 550 U. S. ____ (2007). The analysis is objective:

> "Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented."

Often, it is necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. *KSR* at 14. Also, "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." *KSR* at 15.

When making an obviousness determination, a claimed invention must be considered as a whole. One must avoid hindsight and step back in time just before the invention was made into the mind of a hypothetical "Person of Ordinary Skill in the Art" who does not know the

invention. *In re Dembiczak*, 175 F.3d, 994, 999; 50 U.S.P.Q.2d 1614, 1618 (Fed. Cir. 1999). The phrase, "at the time the invention was made" is important to consider so as to guard against applying hindsight. *Id.* To avoid the "powerful attraction" of hindsight requires a rigorous application of showing the teaching or motivation to combine prior art references. *Id.*

In *Dembiczak*, the appellants' claims in their patent application were directed toward a large trash bag made of orange plastic that when filled with trash or leaves would resemble a Halloween-style pumpkin or jack-o'-lantern. The claims specified "facial indicia" on the outer surface of the bag. *Id.* at 995; 1615. Among the references cited by the examiner in an obviousness rejection under 35 U.S.C. 103 were "conventional" plastic lawn bags and a children's book describing a method of making a "paper bag pumpkin" by stuffing a bag with newspapers, painting it orange, and then painting on facial features with black paint.

Claim 1 is the only currently pending independent claim, and recites that the polymerizable composition is irradiated at a pulse rate greater than or equal to about 500 pulses per second. Applicants have discovered that the manner in which the electron beam dose is delivered can have dramatic effects on the polymerization process itself. Specifically, when the dose per pulse is relatively low (e.g. about 10 to 90 Gy) and the pulse rate is below 500 Hz, the reaction takes place primarily in the homogenous mode because of the longer time intervals between pulses (diffusion). As the frequency of the pulses is increased above about 500 Hz, the heterogeneous mode of polymerization becomes more dominant, because the shorter interval between pulses increasingly favors heterogeneous kinetics (see pp. 13-14 of the specification). This surprising and unexpected discovery is not appreciated or otherwise made obvious anywhere in the art of record.

Nothing in the cited references indicates that the devices for generating e-beams described therein should even have been capable of providing pulse frequencies greater than or equal to 500 Hz. For example, the upper range limit described in Botman is 50 Hz, far below the

500 Hz recited in the present claims. Applicants believe a pulse rate minimum that is 10 times that taught in Botman is not obvious. The Examiner appears to assert that it is possible, using Mukohyama, to derive the teaching of pulses in the range of 500 to 3,000 Hz, but Applicants are unable to identify such teaching in Mukohyama. In addition, Mukohyama fails to make obvious the claimed invention because it merely teaches curing resins into a hard coat, which is not analogous to polymerizing monomers into a tacky adhesive, especially a high quality adhesive as taught in the instant application.

The Examiner asserts that "e-beam polymerization of Weiss et al is inherently a heterogeneous single phase e-beam polymerization". Applicants respectfully disagree. Although Weiss teaches a polymerization method for forming a pressure sensitive adhesive, the present invention further improves upon Weiss by teaching the specific polymerization method comprising providing a substrate; coating at least a portion of said substrate with a polymerizable composition; providing an electron beam that is capable of producing pulses of accelerated electrons; and irradiating said polymerizable composition with said pulses of accelerated electrons thereby heterogeneously polymerizing said polymerizable composition in a single phase, said pulses of accelerated electrons having a dose per pulse of about 10 to about 90 Gy, wherein said composition is irradiated with said pulses of accelerated electrons at a pulse rate equal to or greater than about 500 pulses per second.

Even if Weiss is asserted to teach heterogeneous polymerization, nothing in Weiss teaches pulses of accelerated electrons. Based upon the prior art teachings, one would merely seek to adjust total dose, without appreciating the benefits of the use of low doses at high frequencies. This failure of the prior art to teach or suggest the claimed invention necessitates a finding of non-obviousness of the claimed invention.

In contrast to the prior art methods of producing heterogeneous polymerization, the present invention includes a method of producing heterogeneous polymerization by having a low

dosed pulse and a high pulse rate. The Examiner refers to Applicants' disclosure at page 2, lines 3-7 for the proposition that heterogeneous e-beam polymerization produces highly gelled polymers of adequate chain lengths between crosslinks. However, the Examiner overlooks the further assertion at page 2, lines 7-10 that three known methods of achieving heterogeneous polymerization include emulsion, solid phase catalysis, and precipitating conditions, and that all three of these methods involve phase separation to maintain the heterogeneous conditions.

The present invention claims a totally new, highly efficient and unexpected way to achieve the advantage of heterogeneous polymerization in a single phase system. There is no precedence for this in the prior art, and therefore, the claimed invention is patentable over the cited references. The prior art references of record fail provide all the elements of the pending claims. Even if all the elements were present in the prior art references, there is no reason that one of skill in the art would make a combination of the references. Therefore, the present claims are non-obvious and warrant allowance.

Respectfully submitted,

DOUGLAS E. WEISS

By his Representatives,

Date July 30, 2007

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VIII. CLAIMS APPENDIX

The Claims on Appeal

1. (previously presented) A polymerization method comprising:

   a. providing a substrate;

   b. coating at least a portion of said substrate with a polymerizable composition;

   c. providing an electron beam that is capable of producing pulses of accelerated electrons; and

   d. irradiating said polymerizable composition with said pulses of accelerated electrons thereby heterogeneously polymerizing said polymerizable composition in a single phase, said pulses of accelerated electrons having a dose per pulse of about 10 to about 90 Gy, wherein said composition is irradiated with said pulses of accelerated electrons at a pulse rate equal to or greater than about 500 pulses per second.

2. (original) The method of claim 1, wherein said polymerizable composition comprises at least one polymerizable monomer, at least one oligomer, or a blend thereof.

3. (original) The method of claim 2, wherein said at least one polymerizable monomer comprises a C_{8-13} alkyl acrylate monomer.

4. (previously presented) The method of claim 3, wherein said C_{8-13} alkyl acrylate is selected from the group consisting of isooctyl acrylate, 2-ethylhexyl acrylate, lauryl acrylate and tridecyl acrylate.

5. (original) The method of claim 2, wherein said at least one polymerizable monomer is selected from the group consisting of methyl methacrylate, isobornyl acrylate,

tripropyleneglycol diacrylate, pentaerythritol triacrylate, pentaeryritol tetraacrylate, hydantoin hexacrylate, and trimethylolpropylenetriacrylate.

6. (original) The method of claim 2, wherein said polymerizable composition further comprises at least one comonomer.

7. (original) The method of claim 6, wherein said at least one comonomer is selected from the group consisting of acrylic acid, isobornyl acrylate, octylacrylamide and n-vinyl pyrrolidone.

8. (original) The method of claim 2, wherein said polymerizable composition further comprises a crosslinking agent.

9. (original) The method of claim 2, wherein said polymerizable composition further comprises a thickener .

10. (original) The method of claim 1, wherein said polymerizable composition is irradiated with pulses of accelerated electrons during a residence time of about 1.5 seconds to about 5 seconds.

11. (previously presented) The method of claim 1, wherein said polymerizable composition is irradiated with said pulses of accelerated electrons having a dose per pulse of about 10 to about 40 Gy.

12. (previously presented) The method of claim 1, wherein said polymerizable composition is irradiated with said pulses of accelerated electrons at a pulse rate of about 500 to about

3,000 pulses per second .

13. (previously presented) The method of claim 12, wherein said polymerizable composition is irradiated with said pulses of accelerated electrons having a dose per pulse of about 10 to about 30 Gy.

14. (original) The method of claim 1, wherein the polymerizable composition is irradiated with said pulses of accelerated electrons at a temperature below 20 °C.

15. (original) The method of claim 1, wherein said polymerizable composition is irradiated with said pulses of accelerated electrons at a temperature below 20 °C for about the first 40% to 70% of the time period that said polymerizable composition is irradiated.

16. (canceled).

17. (canceled).

18. (withdrawn) A polymerization method comprising :

a. providing a substrate;

b. coating at least a portion of said substrate with a polymerizable composition;

c. providing an electron beam that is capable of producing pulses of accelerated electrons;

d. irradiating said polymerizable composition with said pulses of accelerated electrons to partially polymerize said polymerizable composition ;

e. providing an electron beam that is capable of producing a continuous beam of accelerated electrons ; and

f. irradiating said partially polymerized polymerizable composition with said continuous beam of accelerated electrons to further polymerize said partially polymerized polymerizable composition.

19. (withdrawn) A method for polymerizing a pressure-sensitive adhesive article comprising:

a. providing a substrate ;

b. coating at least a portion of said substrate with a polymerizable composition ;

c. providing an electron beam that is capable of producing pulses of accelerated electrons; and

d . irradiating said polymerizable composition with said pulses of accelerated electrons at a temperature below 20 °C to polymerize said polymerizable composition of said pressure-sensitive adhesive article .

20. (withdrawn) A pressure-sensitive adhesive article made by the method of claim 19, wherein said pressure-sensitive adhesive article has a conversion of greater than 90 wt%.

21. (withdrawn) A pressure-sensitive adhesive article made by the method of claim 19, wherein said pressure-sensitive adhesive has a shear adhesion time of greater than 300 minutes .

22. (withdrawn) A pressure-sensitive adhesive article made by the method of claim 19, wherein said pressure-sensitive adhesive has a peel adhesion to glass of greater than 25 N/dm.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.